

Grade 6

Standard 1

Number Sense and Computation

CORE STANDARD

Number Sense and Computation

Positive and Negative Numbers

Understand and apply the concept of positive and negative numbers. Add, subtract, multiply and divide positive and negative integers. Represent negative numbers and computation with negative numbers on a number line.

[Standard Indicators: 6.1.1, 6.1.5]

Percent Representations

Use percents to represent parts of a whole. Represent numbers as fractions, decimals and percents.

[Standard Indicators: 6.1.3, 6.1.4]

Multiplication and Division of Fractions and Decimals

Understand and perform multiplication and division with positive decimals and fractions.

[Standard Indicator: 6.1.6]

Ratio and Rate

Solve simple ratio and rate problems using multiplication and division.

[Standard Indicators: 6.1.7, 6.1.8, 6.1.9]

- 6.1.1 Compare, order and represent on a number line positive and negative integers, fractions, decimals to hundredths and mixed numbers.
Example: Find the positions on a number line of 3.56, -2.5, $1\frac{5}{6}$, -4 and $-3\frac{1}{4}$.
- 6.1.2 Interpret the absolute value of a number as the distance from zero on a number line. Find the absolute value of real numbers and know that the distance between two numbers on the number line is the absolute value of their difference.
Example: Use a number line to explain the absolute values of -3 and 7.
- 6.1.3 Use percents to represent parts of a whole. Find the percents part of a whole.
Example: Draw a circle and shade 45 percent of it.
- 6.1.4 Recognize commonly used fractions, decimals, percents and all of their equivalents and convert between any two representations of non-negative rational numbers without the use of a calculator.

Example: Know that $\frac{1}{3} = 0.333\dots$, $\frac{1}{2} = 0.5$, $\frac{2}{5} = 0.4$, etc.

- 6.1.5 Solve problems involving addition, subtraction, multiplication and division of integers and represent computation with integers on a number line. Describe the effect of operations with numbers less than zero.

Example: $17 + -4 = \square$; $-8 - 5 = \square$; $3(-6) = \square$; $-12 \div -2 = \square$.

- 6.1.6 Solve problems involving addition, subtraction, multiplication and division of positive fractions and decimals. Explain why a particular operation was used for a given situation.

Examples:

- You want to place a towel bar $9\frac{3}{4}$ inches long in the center of a door that is $27\frac{1}{2}$ inches wide. How far from each edge should you place the bar? Explain your method.
- Share \$7.25 equally among five people.

- 6.1.7 Interpret ratios, model ratios and use ratios to show the relative sizes of two quantities.

- Use the notations: a/b , a to b and $a:b$.
- Write equivalent ratios.
- Express a ratio in its simplest form.
- Find the ratio of two given quantities.

Example: A car moving at a constant speed travels 130 miles in 2 hours. Write the ratio of distance to time as a fraction in reduced form.

- 6.1.8 Recognize proportional relationships and solve problems involving proportional relationships. Find the missing term in a pair of equivalent ratios. Find one quantity given the other quantity and their ratio to each other.

Example: Sam made eight out of 24 free throws. Assuming Sam's success rate continues, find how many free throws he will make with 60 attempts.

- 6.1.9 Solve simple percent, ratio and proportion problems, including problems involving discounts at sales, interest earned and tips.

Example: In a sale, everything is reduced by 20 percent. Find the sale price of a shirt whose pre-sale price was \$30.

Standard 2

Algebra and Functions

CORE STANDARD

Algebra and Functions

Linear Equations

Write and solve one-step equations and inequalities in one variable.

[Standard Indicators: 6.2.1, 6.2.3]

Linear Functions

Use equations and graphs of linear functions to represent a given situation.

[Standard Indicators: 6.2.4, 6.2.5]

6.2.1 Write and solve one-step linear equations and inequalities in one variable.

Example: The area of a rectangle is 143 cm^2 and the length is 13 cm. Write and solve an equation to find the width of the rectangle. Describe how you will check to be sure that your answer is correct.

6.2.2 Write and use formulas with up to three variables to solve problems.

Example: You have P dollars in a bank that gives r percent simple interest per year. Write a formula for the amount of interest you will receive in one year. Use the formula to find the amount of interest on \$80 at 6 percent per year for one year.

6.2.3 Apply the correct order of operations and the properties of real numbers (i.e., identity, inverse, commutative, associative and distributive properties) to evaluate numerical expressions, including those that use grouping symbols like parentheses. Justify each step in the process.

Example: Simplify $3(4 - 1) + 2$. Explain your method.

6.2.4 Identify and graph ordered pairs in all four quadrants of the coordinate plane.

Example: Plot the points $(3, -1)$, $(-6, 2)$ and $(9, -3)$. Describe the results.

6.2.5 Solve problems involving linear functions with integer values. Create a table and graph the resulting ordered pairs of integers on a grid. Look for patterns in how a change in one variable relates to a change in the second variable and write an equation that models the relationship.

Example: A plant is 3 cm high the first time you measure it (on Day 0). Each day after that, the plant grows by 2 cm. Write an equation connecting the height and the number of the day. Draw its graph.

Standard 3

Geometry and Measurement

CORE STANDARD

Geometry and Measurement

Angles and Polygons

Use properties of complementary, supplementary and vertical angles; properties of triangles; and properties of quadrilaterals to find missing angles.

[Standard Indicators: 6.3.1, 6.3.2]

Shapes and Solids

Find and use the circumference and area of circles and the surface area of right prisms and cylinders.

- 6.3.1 Identify, draw and use the properties of vertical, adjacent, complementary and supplementary angles and the properties of triangles and quadrilaterals to solve problems involving the measure of an unknown angle.

Example: Draw two parallel lines with another line across them. Identify all pairs of supplementary angles.

- 6.3.2 Recognize that the sum of the interior angles of any triangle is 180° and that the sum of the interior angles of any quadrilateral is 360° . Use this information to solve problems.

Example: Find the size of the third angle of a triangle with angles of 73° and 49° .

- 6.3.3 Develop and use the formula for the circumference of a circle and the formula for the area of a circle.

Example: Measure the diameter and circumference of several circular objects. (Use string to find the circumference.) With a calculator, divide each circumference by its diameter. What do you notice about the results?

- 6.3.4 Recognize that real-world measurements are approximations. Identify appropriate instruments and units for a given measurement situation, taking into account the precision of the measurement desired.

Example: A coach is using a wristwatch to measure how fast Carlos and Tyler run a 50-yard dash. The wristwatch displays only hours and minutes. Explain why this wristwatch is an inappropriate instrument.

- 6.3.5 Develop and use the formula for the surface area of a cylinder and volume of a cylinder and find the surface area and volume of three-dimensional objects built from rectangular solids and cylinders.

Example: Find the surface area of a cylindrical can 15 cm high and with a diameter of 8 cm.

Standard 4

Data Analysis and Probability

- 6.4.1 Construct and analyze circle graphs and stem-and-leaf plots.

Example: Display the following data in a stem-and-leaf plot: \$126, \$118, \$100, \$98, \$95, \$138, \$101 and \$116. Write a sentence that summarizes the data. Explain if a circle graph would be a useful way to display this data.

- 6.4.2 Choose the appropriate display for a set of data from bar graphs, line graphs, circle graphs and stem-and-leaf plots. Justify the choice of data display.

Example: Sarah is investigating the price of a gallon of milk in 15 different supermarkets for a school project. Determine whether a bar graph, line graph, circle graph or a stem-and-leaf plot is the best way to display the data. Explain how the type of display you chose is useful in displaying the data.

- 6.4.3 Compare the mean, median and mode for a set of data and explain which measure is most appropriate in a given context.

Example: The following numbers represent the number of touchdown passes completed by seven different quarterbacks during a three-year period: 74, 42, 36, 31, 27, 27, 27. Which statistical summary (mean, median or mode) is most representative of the data? Explain. If an eighth quarterback who completed 90 passes is added to the data, which measure would not be affected?

- 6.4.4 Solve problems involving probability as a measure of chance and verify that the probabilities computed are reasonable.

Example: There are three blue, five green and 12 red marbles in a bag. You pick one at random. Write the probability of picking a green marble as a fraction, decimal and percent.

- 6.4.5 Recognize and represent probabilities as ratios, measures of relative frequency, decimals between 0 and 1, and percents between 0 and 100.

Example: The probability that the Colts will win the Super Bowl next year is 0.85. Express this probability as a ratio and a percent.

PROCESS STANDARDS

Indiana's Academic Standards for Mathematics describe the key content of each grade level and course, and students must develop conceptual understanding of this content. The American Diploma Project noted that, "beyond acquiring procedural mathematical skills with their clear methods and boundaries, students need to master the more subjective skills of reading, interpreting, representing and 'mathematizing' a problem" (p. 55).

The National Council of Teachers of Mathematics has described five Process Standards that "highlight ways of acquiring and using content knowledge" (p. 29). The following Process Standards must be addressed throughout the learning and teaching of Indiana's Academic Standards for Mathematics in all grade levels in mathematics.

Problem Solving

- Build new mathematical knowledge through problem solving.
- Solve problems that arise in mathematics and in other contexts.
- Apply and adapt a variety of appropriate strategies to solve problems.
- Monitor and reflect on the process of mathematical problem solving.

Reasoning and Proof

- Recognize reasoning and proof as fundamental aspects of mathematics.
- Make and investigate mathematical conjectures.
- Develop and evaluate mathematical arguments and proofs.
- Select and use various types of reasoning and methods of proof.

Communication

- Organize and consolidate mathematical thinking through communication.

- Communicate mathematical thinking coherently and clearly to peers, teachers and others.
- Analyze and evaluate the mathematical thinking and strategies of others.
- Use the language of mathematics to express mathematical ideas precisely.

Connections

- Recognize and use connections among mathematical ideas.
- Understand how mathematical ideas interconnect and build on one another to produce a coherent whole.
- Recognize and apply mathematics in contexts outside of mathematics.

Representation

- Create and use representations to organize, record and communicate mathematical ideas.
- Select, apply and translate among mathematical representations to solve problems.
- Use representations to model and interpret physical, social and mathematical phenomena.

In addition, estimation, mental computation and technology are areas that need to be addressed at all grade levels in mathematics.

Estimation and Mental Computation

- Know and apply appropriate methods for estimating the results of computations.
- Round numbers to a specified place value.
- Use estimation to decide whether answers are reasonable.
- Decide when estimation is an appropriate strategy for solving a problem.
- Determine appropriate accuracy and precision of measurements in problem situations.
- Use properties of numbers and operations to perform mental computation.
- Recognize when the numbers involved in a computation allow for a mental computation strategy.

Technology

- Technology should be used as a tool in mathematics education to support and extend the mathematics curriculum.
- Technology can contribute to concept development, simulation, representation, communication and problem solving.
- The challenge is to ensure that technology supports, but is not a substitute for, the development of skills with basic operations, quantitative reasoning and problem-solving skills.
 - Graphing calculators should be used to enhance middle school and high school students' understanding and skills.
 - The focus must be on learning mathematics and using technology as a tool rather than as an end unto itself.

References

American Diploma Project (2004). *Ready or not: Creating a high school diploma that counts*. Washington, DC: Achieve, Inc.

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*. Reston VA: author.